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I do not object to this criticism if Mr. Maxwell Hall can show that his results have smaller probable error and greater freedom from systematic error than mine. When his results are published it will be time enough to examine this question. I concede at once the advantages which the method of Mr. Hall affords in simplicity of reduction; but it appears to me that, when an exceptionally favourable opportunity, like the late opposition of *Mars*, occurs, the question is not what is the *easiest*, but what is the *best* method to observe it.

I object very strongly, however, to the proof which Mr. Maxwell Hall puts forward as to the accuracy of his observations. He contends that his observations are so accurate that by their means he has succeeded in determining the variation of the rate of his clock in short intervals, and makes the rather extraordinary statement that, though the rate of his clock may be relied upon from day to day for uniformity of rate to half a second, yet it varies two or three tenths of a second in intervals of ten or fifteen minutes. I am very much puzzled to find how Mr. Hall arrives at this conclusion and how he distinguishes between errors of observation and errors of clock rate.

The only proof of the supposed errors of his clock rate he finds in the various different values of the difference of R.A. between the same comparison stars obtained from observations at different times. It is obvious that these differences may be caused either by error in clock rate or by errors of observation; and, from the observations only, it seems to me impossible to say definitely to which of the two causes the discordances must be attributed. But, from what I know of clocks and their rates, the probabilities appear to me exceedingly strong that Mr. Hall himself is more likely to have made the errors in question than his clock. With regard to Mr. Hall's remarks which appear to imply that undue time has been occupied in my reductions, I think that the papers I have laid before the Society to-night are their best answer.

On the Observed Errors of Bouvard's Tables of Saturn.

By E. Dunkin, F.R.S.

During the discussion at the December meeting, after the reading of the Astronomer Royal's paper on the approaching conjunction of *Mars* and *Saturn*, reference was made to the large errors of Bouvard's Tables, on which the tabular places of *Saturn* given in the *Nautical Almanac* for 1879 depend. On that occasion I made a remark that the tabular errors of *Saturn*, deduced at Greenwich from recent observations, are not really so large as indicated by a direct comparison of the corresponding places inserted in the *Nautical Almanac* for 1879 and 1880, derived respectively from the Tables of Bouvard and Le Verrier. It

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appears to me that the subject is sufficiently interesting to make it desirable to place on record in the *Monthly Notices* the actual amount of the observed tabular errors of *Saturn* during the last few years, determined from the Greenwich observations. On an examination of these errors, it will be perceived that their magnitude has been increasing of late, and the numbers in the following Table point to a further increase in the present year, though we can hardly anticipate that the amount of error will reach that found from the single comparison between the Tables of Bouvard and Le Verrier.

The numbers given below have been deduced from the Greenwich observations made near opposition, and when *Saturn* passed the meridian near 6^h, or near the time of the planet's quadrature with the Sun. From the observed errors of geocentric longitude and ecliptic polar distance of *Saturn* for the last eleven years, beginning with 1868, I have calculated the angular distances between the observed places and the tabular places, from which the general magnitude of the error from year to year can be easily seen. These, with the observed errors in R.A. and N.P.D., are given in the Table.

Year.	From Mean of Group nearest Opposition.			From Mean of Group nearest 6^h M.T.		
	Error in		Difference between Observed and Tabular Places.	Error in		Difference between Observed and Tabular Places.
	R.A.	N.P.D.		R.A.	N.P.D.	
	s	″	′	s	″	″
1868	−0·50	+5·02	8·8	−0·60	+ 3·51	9·1
1869	−0·86	+2·81	12·4	−0·94	+ 0·87	13·4
1870	−0·89	+1·65	12·5	−0·83	+ 0·44	12·3
1871	−0·86	−0·31	12·0	−0·56	− 1·07	7·8
1872	−0·71	−1·49	10·0	−0·34	− 2·72	5·5
1873	−0·75	−3·52	11·1	−0·25	− 4·92	6·1
1874	−0·60	−4·12	9·6	−0·16	− 6·50	6·9
1875	−0·78	−6·72	13·2	−0·25	− 8·30	9·1
1876	−0·83	−5·65	13·5	−0·18	− 9·24	9·7
1877	−0·62	−8·92	12·8	−0·27	−10·43	11·2
1878	−0·77	−8·03	14·1	−0·52	− 8·60	11·5
Corresponding numbers deduced from the *Nautical Almanac*, 1879-80.						
1879				−1·44	− 3·00	21·9

Assuming Le Verrier's Tables of *Saturn* to be correct, the tabular error of Bouvard's Tables in geocentric longitude on 1880, January 1, is −18″·72, and that of ecliptic north polar distance is −11″·26, equivalent to a difference of 21″·9 between the separate places as derived from the old and new Tables. On this day *Saturn* passes the meridian of Greenwich at 5^h 55^m

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M.T., and this difference therefore becomes comparable with the numbers in the last column deduced from observation.

Though the tabular error of Bouvard's Tables appears to be increasing at the present time, we should hardly expect to find so great an increase as 10″ in the interval between December 1878 and December 1879, viewed in conjunction with the column of errors determined from observations made near 6^h; and may we not therefore assume that the large difference found between the two calculated places for 1880, January 1, is partly due to small outstanding errors in the new Tables?

Blackheath,
1879, *January* 4.

On the Reduction of the North Polar Distances of the First Melbourne General Catalogue for 1870 to Auwers' Standard.

By A. W. Downing, B.A. (Dublin).

This investigation consists essentially of a comparison of the North Polar Distances of the Cape Catalogue for 1860 with those of the Melbourne Catalogue. The reduction of the latter to the Standard is then accomplished by applying to the differences Cape—Melbourne for different N.P.D.'s the corrections applicable to the N.P.D.'s of the Cape Catalogue to reduce them to the Standard, which I have given in a former paper, printed in the *Monthly Notices* for December 1878.

There are 352 stars common to the Cape and Melbourne Catalogues which are available for the comparison, after rejecting those whose places in either Catalogue depend on a single observation. I have also rejected *α Centauri* and another star which gave a discordant result. As the southern stars have generally been reduced to the mean epochs of the Catalogues with different proper motions in each Catalogue, it has been necessary to correct the places given in one of the Catalogues for the difference, and the proper motion given in the Cape Catalogue has been adopted as the one to be used, except in those cases in which this proper motion is taken from the B.A.C., when the value given in the Melbourne Catalogue has been used in preference. The places in the Cape Catalogue have then been brought up to 1870, with the precessions given in this Catalogue and the adopted proper motion, and the difference taken between the N.P.D. thus obtained and that given in the Melbourne Catalogue, corrected, if necessary, for assumed proper motion. The 352 stars, having been arranged in order of N.P.D., have been taken in groups, each group embracing about 5°, and the means taken of the N.P.D.'s and of the differences between the Catalogues for each group. These mean differences have been